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Soviet Program for Development of New BCW Agents (C)

Interagency Intelligence Memorandum

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SOVIET PROGRAM FOR DEVELOPMENT OF NEW BCW AGENTS (C)

Information available as of 9 September 1985 was used in the preparation of this Memorandum.

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PREFACE

This Interagency Intelligence Memorandum addresses a Soviet program that uses advanced biotechnologies to derive biological and chemical warfare (BCW) agents. [redacted] Traditional BW and CW development programs are not within the scope of this paper. (S NF)

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This publication was prepared under the auspices of the National Intelligence Officer at Large. [redacted] The paper was coordinated within CIA and with the Foreign Science and Technology Center, the Foreign Technology Division, the National Security Agency, the Naval Intelligence Support Center, the Defense Intelligence Agency, and the National Photographic Interpretation Center. (S)

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KEY JUDGMENTS

Over the past decade the Soviet Union has expanded its traditional R&D program for developing new biological and chemical warfare (BCW) agents to include a program that applies advances in biotechnologies such as genetic engineering. This means that the Soviets may in the future be able to develop a much broader range of agents than was heretofore possible. Because of the program's organization, it would be possible to limit the scope to research and such development and testing as might be considered acceptable for defensive purposes, and yet produce sufficient quantities of agents for weaponization within months of production initiation. [redacted] 25X1 This has implications for assessing compliance with the Biological Weapons Convention. We do not know what impact the development of such BCW agents may have on Soviet BCW employment doctrine. [redacted] 25X1

The duration of the research program and assessment of openly published Soviet biotechnology research suggest that limited testing of prototype agents may have occurred as early as 1981. More extensive test range evaluation may have begun at any time subsequently. Although testing activities have been documented in the Soviet Union, existing data do not incontrovertibly tie agents produced within this program with those activities. If our timetable assessments are accurate, however, prototype agents could now be available for limited use, clandestinely or by surrogates in remote locations. We do not believe the agents are currently available in large quantities. [redacted] 25X1

There is a potential for unrecognized use of these agents because they could mimic naturally occurring epidemics. Similarly, unknown agents might be used for wide-scale destruction of crops or livestock. [redacted] 25X1 [redacted] 25X1

The range of agents that could result from this program includes:

— Infectious agents that are naturally occurring but have been modified to enhance weaponization potential.

— Compounds that normally are present in the body in minute quantities. These compounds can produce a wide range of deleterious effects if introduced in higher-than-normal concentrations or if genetic or chemical manipulation has been used to alter their structure or activity.

— Toxins not normally found in humans but derived from other organisms, such as bacteria, fungi, plants, and some animals, could also be altered or synthesized for use as agents. [redacted] 25X1

The effects caused by these potential agents could range from emotional and behavioral changes to physical effects such as extreme pain, rapid induction of sleep, hemorrhage, and death. Properties could conceivably be tailored to specific field requirements for stability, persistence, dissemination, and rapidity of effect. In a field setting, there would surely be an unquantifiable psychological impact on combat units subjected to such agents, and the psychological stress could severely degrade morale and impair combat effectiveness. [redacted] 25X1

[redacted] 25X1 the Soviets can develop vaccines or other medical protection specific for the agents to be deployed. This would allow them to operate without restrictive physical protection in a contaminated area. [redacted] 25X1

The organization of major aspects of this program differs from our perception of the traditional BCW program in that R&D activities are reportedly to be carried out in classified research establishments scattered across the USSR, and the resultant organisms—agents themselves or agent-producing—held there in small quantities until required for use. At that time these "seed" cultures would be shipped to a number of predesignated and specially equipped Microbiological Industry production plants otherwise normally engaged in producing materials for civilian use. Conversion of these plants to agent production could probably be accomplished in days to weeks. There is thus no need for large-scale agent storage over a long term. In addition, several different agents could be produced rapidly at these plants with little need for large amounts of precursor compounds and no need for additional conversion. [redacted] 25X1

The support that has been given to Soviet molecular genetics and biochemical research has allowed the scientists to achieve quickly a high level of competence in using sophisticated techniques. Whereas the Soviets' research has generally lagged Western (especially US) state of the art, their capabilities when targeted in this fashion are sufficient to carry out the R&D required for development of these agents. [redacted] 25X1

Western technology acquisition has been central to the rapid progress of biotechnology development in the USSR. The United States, however, is no longer the principal direct supplier of biotechnology research expertise to the USSR and in the last decade increasingly has been supplanted by other Western nations as suppliers of research equipment and materials. Curtailment of technology transfer from the United States might temporarily slow research progress but would not prove a permanent impediment. [redacted] 25X1

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[redacted]

— As already demonstrated by the "yellow rain" usage in Southeast Asia, both detecting and documenting deliberate use of unidentified BCW agents are difficult. (S NF) 25X1

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ANNEX A

Genetic Engineering Tutorial

1. The term "genetic engineering" often is used interchangeably with the term "recombinant DNA," but they are not synonymous. Genetic engineering refers to the capability to modify the genetic characteristics of cells or organisms at the molecular level. It depends upon a broad spectrum of advanced basic and applied research techniques that have evolved from molecular biology and related research in biochemical genetics and cell physiology. Through genetic engineering, production of microorganisms and biochemicals from them can be enhanced. (U)

2. Recombinant genetics encompasses only that specialized area of genetic engineering in which new genetic material is placed into (chemically recombined into) a host organism in order to alter that organism's properties. The transferred genetic material may be taken from another organism or synthesized in the laboratory. The altered—recombinant—organisms may themselves be the product, or they may be cultured in a fermentation system to produce otherwise unobtainable quantities of a desired biochemical. (U)

3. Only over the past decade have researchers achieved the major scientific and technical breakthroughs that allow purposeful manipulation of the genetic properties of living organisms, particularly small organisms like bacteria and viruses. The United States, followed by Western Europe and Japan, has been at the forefront of these biotechnology developments and has consistently maintained a molecular genetics research program that is broader in scope and more advanced overall than anywhere else in the world. In recent years, private industry in the West (but, again, to the greatest extent in the United States) has begun attempting to exploit these new molecular genetics techniques to produce and market commercially important compounds. (U)

4. Industrial applications have focused largely on production of pharmaceuticals and other chemicals that now can be produced more cheaply and in greater quantities than was previously possible. Other commercial applications include such things as bacterially enhanced mining, oil recovery, and agricultural production, as well as pest control and the production of fibers and plastics. Scientific studies have included exploration of the mechanisms of brain and central nervous system function, and other physiologic research. (U)

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ANNEX B

Biotechnology Development in the USSR

1. The development of modern biotechnology is a major objective of Soviet science. From official Soviet publications we know that biotechnology has captured the attention of the party Central Committee and the Council of Ministers as providing potential solutions to longstanding internal problems in such areas as agriculture and medicine. In 1981 the Soviets established an Interagency Scientific and Technical Council to coordinate the civilian biotechnology research and development spread among four ministries, the Academy of Sciences, the Academy of Medical Sciences, and the Microbiological Industry. The emphasis in the civilian program is on research directed toward utilitarian and commercially marketable products such as pharmaceuticals, synthetic fuels, food and food additives, and toward biodegradation of substances that resist natural decomposition. [redacted]

2. A publication describing research of the Institute of Bioorganic Chemistry, Moscow, whose chief is Yuriy Ovchinnikov, states that the S&T Council—also headed by Ovchinnikov—plans and coordinates the research and technological developments in physicochemical biology and biotechnology of more than 200 scientific institutions within the USSR Academy of Sciences, Academies of Sciences in the Soviet republics, the All-Union Lenin Academy of Agricultural Sciences, the Academy of Medical Sciences of the USSR, the Public Health Ministry, the Ministry of Agriculture, the Ministry of Higher Education, the Central Board of the Microbiological Industry of the USSR (Glavmikrobioprom), and others. [redacted]

3. Soviet expansion in biotechnology generally has mirrored that which has taken place in the West with a lag time of two to four years. Although fewer in number than their Western counterparts, some Soviet molecular biologists, concentrating on basic and applied sciences, have proved to be just as technically competent. Currently there are more than 75 institutes and universities in the Soviet Union with basic and applied genetic-engineering and related research programs. [redacted] 25X1

4. Despite significant expansion within the last five years, the Soviet research effort is still technically inferior to that of the United States. Nonetheless, innovative research and state-of-the-art technological development could well have occurred in areas given special emphasis. [redacted] 25X1

[redacted] 25X1 25X1

6. It is our judgment that Western technology acquisition has been central to the rapid progress of biotechnology development in the USSR. The United States is no longer the principal direct supplier of biotechnology research equipment and expertise to the USSR, having been in the last decade increasingly supplanted by other Western nations. [redacted] 25X1

7. Since the late 1970s, the Soviets have expanded their genetic-engineering methodology base by coordinating and planning programs and training scientists at home and abroad. In addition, they have utilized a wide range of open and clandestine methods for collecting information. By utilizing open literature, scientist-to-scientist exchanges, and acquisition of Western data bases and research products, the Soviet Union has reduced its need to develop the broad scientific base required by Western countries for progress. By capitalizing on acquisition of Western technology, the Soviets have been able to begin at the midpoint in the learning curve and avoid taking costly risks. We expect that the Soviets will excel in specific targeted areas of genetic engineering/biotechnology. [redacted] 25X1 25X1

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ANNEX F

Agent Potential

1. Biotechnology-derived warfare agents compose two distinct classes or groups of agents:

- — Naturally occurring infectious agents and those genetically enhanced to increase their potential for weaponization, or organisms into which the biological machinery to produce a foreign substance has been introduced.
- — Bioregulators,[22] toxins, venoms, and their biologically active subfractions, produced through genetic engineering/biotechnical means. (c)

Depending on the type of agent and route of administration, the effects can range from incapacitation to rapid death. (c)

Infectious Agents

2. Infectious agents can be altered by laboratory modification of the genetic material so the organism is more virulent (the ability to overcome body defenses) and/or is drug resistant:

- — One example of such an effort—production of a pathogenic tularemia strain resistant to the antibiotic spectinomycin—was published by researchers at the Scientific Research Institute of Epidemiology and Microbiology *imeni* N. F. Gamaleya in Moscow. These researchers used classical genetic techniques to derive the antibiotic-resistant strain, rather than the new genetic-engineering methodologies. (See annex A.)

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4. A third method of changing an infective organism is to incorporate genetic coding to make the organism more stable to aerosolization and exposure to environmental factors. Several environmental factors such as ultraviolet light (sunlight), varying atmospheric humidity, extreme temperatures, and dehydration cause microorganisms to lose infectivity and viability:

- — [redacted] 25X1 genetically engineered *E. coli* that will survive the environmental hazards encountered by an aerosolized warfare agent.
- — This hardy organism—or some other potential vector—could carry a gene coding for the production of a toxin, venom fraction, or other bioregulator. [redacted] 25X1

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Bioregulators

5. The bioregulators that might be used in warfare would incapacitate by causing psychological effects such as the inability to act or make decisions; inappropriate response to specific danger; a heightened awareness of pain; and analgesia (no sense of pain). However, depending on factors such as dose and route of administration, they could be lethal. (c)

[22] Bioregulators are compounds that are essential for the normal psychological and physiological functions of a living organism. Many are found in the human body in minute concentrations. Alternate forms may be synthesized to mimic or enhance their effects. These low-molecular-weight compounds are usually peptides (components of proteins made up of amino acids). They include neuroregulators and neurotransmitters of the central nervous system, protein hormones, and enzymes produced in other parts of the body. These compounds can cause a wide range of harmful effects if introduced at higher-than-normal concentrations or following genetic or chemical manipulations that would, for example, change specificity or duration of action. (c)

[23] *E. coli* is normally present in the body and is necessary for the proper functioning of human digestion. Since the inception of recombinant DNA methodology, more than a decade ago, *E. coli* has been the standard vehicle used for genetic engineering. (U)

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